17/05/2002 10/023,163

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SYSTEM:OS  - DIALOG OneSearch
  File 348:EUROPEAN PATENTS  1978-2002/May W01
         (c) 2002 European Patent Office
  File 349:PCT FULLTEXT  1983-2002/UB=20020516,UT=20020509
         (c) 2002 WIPO/Univentio
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17/05/2002 10/023,163

| Set | Items | Description |
|---|---|---|
| S1 | 6421 | (MRI OR MAGNETIC()RESONAN???? OR MRA OR NMR OR MAGNETORESONANCE OR PMR OR PROTON()MAGNETIC()RESONAN???? OR MR()IMAG???)-/AB,TI,CM |
| S2 | 34 | ((THREE OR MULTIPLE OR MULTI OR SEVERAL OR ARRAY)(2N)GRADIENT? ?(3N)COIL? ?)/TI,AB,CM |
| S3 | 34610 | COMPENSAT????/TI,AB,CM |
| S4 | 253 | (SELF()(INDUC??? OR INCREAS??? OR INITIAT??? OR PRODUC??? OR GENERAT???))/TI,AB,CM |
| S5 | 855 | (ITSELF(3N)(INDUC??? OR INCREAS??? OR INITIAT??? OR PRODUC??? OR GENERAT???))/TI,AB,CM |
| S6 | 1607 | (EDD???(3N)CURRENT? ?)/TI,AB,CM |
| S7 | 31304 | (CONDUCT?????(3N)(ELEMENT? ? OR DEVIC?? OR LAYER? ? OR COMPONENT? ?))/TI,AB,CM |
| S8 | 72 | ((THREE OR MULTIPLE OR MULTI)(3N)GRADIENT? ?(3N)FIELD? ?)/TI,AB,CM |
| S9 | 58 | (HOMOGEN??????(3N)(STATIC OR STEADY()STATE)(3N)MAGNETIC(3N)FIELD? ?)/TI,AB,CM |
| S10 | 22992 | HOMOGEN??????/TI,AB,CM |
| S11 | 614 | ((STATIC OR STEADY()STATE)(3N)MAGNETIC(3N)FIELD? ?)/TI,AB,CM |
| S12 | 717 | (CONTROL?????(3N)CURRENT? ?(3N)PULS??)/TI,AB,CM |
| S13 | 521 | (SKIN(3N)EFFECT? ?)/TI,AB,CM |
| S14 | 2033 | ((DISK? ? OR RING? ? OR SURROUND??? OR AROUND OR ROUND??? OR DIAMETER??? OR CIRCULAR??? OR CIRCL?????? OR (CIRCULAR??(2N)BEND OR BENT) )AND FERROMAGNET???)/TI,AB,CM |
| S15 | 32 | S1 AND S2 |
| S16 | 4 | S15 AND S3 |
| S17 | 0 | S16 AND S4 |
| S18 | 0 | S15 AND S4 |
| S19 | 0 | S15 AND S5 |
| S20 | 9 | S15 AND S6 |
| S21 | 1 | S20 AND S7 |
| S22 | 380 | (GRADIENT? ?(3N)COIL? ?)/TI,AB,CM |
| S23 | 45 | S22 AND S3 |
| S24 | 1104 | S4:S5 |
| S25 | 0 | S23 AND S24 |
| S26 | 0 | S22 AND S24 |
| S27 | 1 | S23 AND S7 |
| S28 | 1 | S27 NOT S21 |
| S29 | 28 | S22 AND S8 |
| S30 | 3 | S29 AND S9 |
| S31 | 0 | S29 AND S12 |
| S32 | 0 | S29 AND S13 |
| S33 | 0 | S29 AND S14 |
| S34 | 14 | S1 AND S24 |
| S35 | 0 | S34 AND S6 |
| S36 | 0 | S34 AND S7 |
| S37 | 0 | S34 AND S11 |
| S38 | 101 | S1 AND S6 |
| S39 | 8 | S38 AND S7 |
| S40 | 0 | S39 AND S8 |

STIC-EIC 2800 CP4-9C18 Irina Speckhard 308-6559

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| | | |
|---|---|---|
| S41 | 341 | S1 AND S22 |
| S42 | 62 | S41 AND S11 |
| S43 | 15 | S42 AND S10 |
| S44 | 1 | S42 AND S12 |
| S45 | 0 | S43 AND S7 |
| S46 | 0 | S43 AND S24 |
| S47 | 3 | S43 AND S3 |
| S48 | 1 | S44 NOT S47 |
| S49 | 0 | S42 AND S14 |
| S50 | 4750 | FERROMAGNET???/TI,AB,CM |
| S51 | 1 | S42 AND S50 |
| S52 | 72 | S1 AND S14 |
| S53 | 2 | S52 AND S6 |

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21/TI,PN,PD,PR,K/1 (Item 1 from file: 349)
DIALOG(R)File 349:(c) 2002 WIPO/Univentio. All rts. reserv.

SHIELDED GRADIENT COIL FOR NUCLEAR **MAGNETIC RESONANCE** IMAGING
BOBINE A GRADIENT BLINDEE UTILISEE EN IMAGERIE PAR RESONANCE MAGNETIQUE NUCLEAIRE
Patent and Priority Information (Country, Number, Date):
Patent: WO 9119994 A1 19911226
Priority Application: US 90142 19900606; US 90888 19900629

SHIELDED GRADIENT COIL FOR NUCLEAR **MAGNETIC RESONANCE** IMAGING
Fulltext Availability:
Claims

English Abstract
An RF shield for **NMR** opaque to RF energy but that permits audio frequency signals such as those of a gradient coil to penetrate an examination region. The surface of the shield is made up of an outside **conductive layer** (43) which is divided by etched channels (28). The etched channels (28), define circumferential strip-shaped areas (30) at the edges of the cylinder walls...

Claim
le A shield for an RF coil in a nuclear **magnetic resonance** system for containing the field generated by said RF coil while allowing lower frequencies to pass through said shield, said shield comprising:
an outer main...

...strips, and where current
changes from a longitudinal to a circumferential direction (or vice versa).

3 A shield for an RF coil in a nuclear **magnetic resonance** system for containing the field generated by said RF coil while allowing lower frequencies to pass through said shield, said shield comprising:
a generally cylindrical...are bridged by one or more capacitors.
12* A structure for connecting an ancillary
2- conductor to a shield for a coil in a nuclear **magnetic resonance** system comprising a dielectric strip mounted on the coil shield, said dielectric strip serving to capacitively couple the conductor to the shield at RF frequencies and to insulate the conductor from the shield at lower frequencies,

13 A shield for an RF coil in a nuclear **magnetic resonance** system, of a size to accomodate the whole adult body, for containing the field generated by said RF coil while allowing lower frequencies to pass...

...of
conductive strips separated by a plurality of insulating

channels;
an insulating layer separating said inner main layer and outer main layer,
wherein, to reduce **eddy current** losses at said lower frequencies, substantially all of said conductive strips have widths of less than **three** inches.

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28/TI,PN,PD,PR,K/1 (Item 1 from file: 349)


SUSCEPTIBILITY **COMPENSATED** COILS
BOBINES A SUSCEPTIBILITE COMPENSEE
Patent and Priority Information (Country, Number, Date):
Patent: WO 9600400 A1 19960104
Priority Application: AU 946387 19940623

SUSCEPTIBILITY **COMPENSATED** COILS
Fulltext Availability:
Claims

English Abstract
A multi-**layer conductor element** (1) is used to form a coil for use as a RF or **gradient coil** in NMR apparatus. The **conductor element** (1) comprises **layers** of diamagnetic and/or paramagnetic materials (2, 3), the material type, size and/or shape being selected to minimise spatial perturbation of the static magnetic...

...equations. By appropriate combination of the positive susceptibility of paramagnetic material and the negative susceptibility of diamagnetic material, the resultant susceptibility of the coil is **compensated** to minimise field perturbation. A multi-layer shield (4) comprising paramagnetic and/or diamagnetic materials is placed within a coil to minimise local distortion of...

Claim
1 1 A **conductor element** adapted for use in a coil of the type used in a static magnetic field in NMR apparatus, characterised in that the **conductor element** comprises a plurality of layers of diamagnetic and/or paramagnetic materials, the material type, size and/or shape being selected to minimise spatial perturbation of the static magnetic field due to the presence of the coil therein.

2 A **conductor element** as claimed in claim 1 wherein the selection of material type, size and/or shape is governed by the solution of magnetostatic equations appropriate for the particular application.

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30/TI,PN,PD,PR,K/1 (Item 1 from file: 348)


NMR spectroscopy method and apparatus for carrying out the method
Kernresonanzspektroskopieverfahren und Anordnung zur Durchfuhrung des Verfahrens
Procede de spectroscopie RMN et dispositif de mise en oeuvre du procede
PATENT (CC, No, Kind, Date): EP 496447 A1 920729 (Basic)
EP 496447 B1 970723
PRIORITY (CC, No, Date): DE 4102023 910124

...ABSTRACT Translated)
The invention relates to an NMR spectroscopy method in which, in the presence of a **homogeneous steady-state magnetic field**, a multiplicity of sequences acts on an area of examination, each of which sequences comprises at least three high-frequency pulses, preferably arranged as 90...

...This simultaneously enables a spatial and spectral determination of the lactate components to be carried out if it is provided that at least one magnetic **gradient field** is effective between or after the **three** high-frequency pulses, and the time integral over at least one of these gradient fields is varied when the sequences are repeated, and that, in...

...CLAIMS duration such that spin resonance signals occurring subsequent to the third RF pulse are determined exclusively by double quantum coherence,

characterized in that between the **three** RF pulses at least one magnetic **gradient field** (G5)), G6))) is active, the time integral over at least one of these gradient fields being varied during repetition of the sequences, the second RF...

...appearing each time after the third RF pulse (HF3))), means (17) for determining the spectrum and the nuclear magnetization distribution from the spin resonance signals, **gradient coil** systems (3,5,7) for generating magnetic gradient fields, and a control unit 15 which is programmed so that at least one magnetic **gradient field** (G5)), G6))) is active between the **three** RF pulses and that the time integral over at least one of these gradient fields is varied during the repetition of the sequences.

30/TI,PN,PD,PR,K/2 (Item 2 from file: 348)


NMR spectroscopic method and apparatus for using it
..ABSTRACT Translated)
The invention relates to a method in which, in the presence of a **homogeneous steady-state magnetic field**, a multiplicity of sequences, each of which comprises at least three high-frequency pulses, acts on an area of investigation, the distance between the first...

...CLAIMS three RF pulses (HF1)) ... HF3))), three further RF pulses (HF4)) ... HF6))) which act as 180(degree) pulses and which are accompanied by a respective magnetic **gradient field** (Gx, Gy, Gz), the **gradients** of the **gradient fields** applied for the **three** 180(degree) pulses extending perpendicularly to one another.

10. A magnetic resonance apparatus, including
- a magnet (1) for generating a uniform, steady magnetic field,
- an RF coil system (11) for generating RF signals and for receiving spin resonance signals,
- an RF transmitter (4) for generating RF pulses (HF1))...H3))),
- a **gradient coil** system (3, 5, 7) for generating magnetic gradient fields,

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30/TI,PN,PD,PR,K/3 (Item 1 from file: 349)
DIALOG(R)File 349:(c) 2002 WIPO/Univentio. All rts. reserv.

MAGNETIC RESONANCE SCANNER WITH ELECTROMAGNETIC POSITION AND ORIENTATION TRACKING DEVICE
SCANNER A RESONANCE MAGNETIQUE DOTE D'UN DISPOSITIF ELECTROMAGNETIQUE DE SUIVI DE POSITION ET D'ORIENTATION
Patent and Priority Information (Country, Number, Date):
Patent: WO 200037955 A2 20000629 (WO 0037955)
Priority Application: US 98113782 19981223

Fulltext Availability:
Claims

Claim
... axis and the homogeneous region is not in between the first loop and the second loop.

19 An arrangement of current carrying loops for generating **three** primary
magnetic **field gradients** wherein each direction of the primary magnetic **field gradient** is parallel to one of **three** orthogonal axes, the arrangement for use in a magnetic resonance scanner, the arrangement comprising:
a first pair of adjacent coplanar loops capable of carrying current...

...radio frequency signals and
acquisition of the magnetic resonance signal.

24 The magnetic resonance scanner according to claim 23, further comprising:
to a magnetic field **gradient coil** assembly for generating a spatial variation
of the static magnetic field.

25 The magnetic resonance scanner according to claim 23, wherein in the sequence the having a
location, the system comprising:
a magnetic resonance scanner having a static **magnetic field** assembly
capable of acquiring a **magnetic** resonance signal from a **homogeneous** region
created by the **static magnetic field** assembly; and
an electromagnetic location tracking device in communication with the magnetic resonance scanner for providing the location of the target relative to
the homogeneous...

...for excitation of nuclear spins of the
target at the homogenous region and detection of a resulting magnetic resonance signal of the nuclear spins;
a **magnetic field gradient coil** assembly for
generation of spatial variation

of the **static magnetic field** at the **homogenous**
region; and
a processor for executing a sequence of generating radio frequency signals for excitation of the nuclear spins of the target, generating signals for creation of the spatial variation of the static magnetic field through the magnetic field
**gradient coil** assembly and creating an output from the detected magnetic
resonance signal.

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39/TI,PN,PD,PR,K/1 (Item 1 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

Low noise **MRI** scanner
Gerat der bildgebenden magnetischen Resonanz mit geringer Larmemission
Scanner IRM a faible bruit
PATENT (CC, No, Kind, Date): EP 1193507 A2 020403 (Basic)
PRIORITY (CC, No, Date): US 676945 001002

Low noise **MRI** scanner

...ABSTRACT A2
A low noise imaging apparatus for producing **Magnetic Resonance** (**MR**) **images** of a subject and for substantially minimizing acoustic noise generated during imaging is provided. The imaging apparatus comprises a magnet assembly (4,6,7), a...

...CLAIMS A2
1. An imaging apparatus for producing **Magnetic Resonance** ( **MR**) **images** of a subject (200) contained within a patient bore tube defining an imaging volume (101) and for substantially minimizing acoustic noise generated during imaging, said...

...402,502) for transmitting a radiofrequency pulse, for receiving an MR signal induced in said subject (200), said conductors having respective widths selected for reducing **eddy current** excitation contributing to acoustic noise.
.plurality of conductors (502) having a width selected for transmitting a radiofrequency pulse, for receiving an MR signal induced in said subject and for reducing **eddy current** excitation contributing to acoustic noise in and about said imaging apparatus;

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39/TI,PN,PD,PR,K/2 (Item 2 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

Radio frequency coil for open **magnetic resonance** imaging system
Radiofrequenzspule fur ein offenes System der bildgebenden magnetischen Resonanz
Bobine radiofrequences pour un systeme ouvert de l'imagerie par resonance magnetique
PATENT (CC, No, Kind, Date): EP 1115005 A2 010711 (Basic)
PRIORITY (CC, No, Date): US 455430 991206

Radio frequency coil for open **magnetic resonance** imaging system

...ABSTRACT A2

A quadrature coil (24) suitable for use with an open frame **MRI** system provides crossing pairs of arrays (32a-32d) of parallel **conductor elements** (34a-34d), respectively. Compact configuration is provided through use of an isolating circuit (66) for incorporating parasitic capacitances at the resonance frequency of the coil into a blocking parallel resonance. Termination of the parallel **conductor elements** may be accomplished by equal impedance node connectors formed from branching pairs of conductors or a triangular least resistance connection form. RF shields are provided by pairs of conductive sheets containing **eddy current** reducing slots aligned with the parallel **conductors elements** of the coil.

...CLAIMS A2

1. A quadrature coil (24a-24d) for operation at a radio frequency in an open **MRI** system (18), the **MRI** system having a polarizing magnet with opposed pole faces (20) for establishing therebetween a polarizing field axis (B0))), the coil comprising:

a first conductor array (32a) providing separated and substantially aligned **conductor elements** (34a) positioned along a first conductor axis extending across the polarizing field axis to opposed, common connection points (36a);

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39/TI,PN,PD,PR,K/3 (Item 3 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

**MRI** magnet assembly with non-conductive inner wall
Magnetanordnung fur die bildgebende Magnetresonanz mit nichtleitender innerer Gefasswand
Assemblage d'aimants pour l'IRM avec une paroi interieure non-conductrice
PATENT (CC, No, Kind, Date): EP 981057 A2 000223 (Basic)
EP 981057 A3 011017
PRIORITY (CC, No, Date): US 134764 980814

**MRI** magnet assembly with non-conductive inner wall

...ABSTRACT inner wall (14) of the magnet assembly. To reduce gradient coil noise, the inner wall is constructed of a nonconductive material which does not support **eddy currents**.

CLAIMS 1. A magnet assembly for an **MRI** system, comprising;
a vessel cylinder having an outer wall and a bore axis;
a pair of annular-shaped end plates fastened to respective ends of...

...claim 1 wherein the inner wall includes a vapor barrier.
5. The magnet assembly of claim 4 wherein the vapor barrier comprises a first non-**conductive layer**, and a ribbon comprised of a metal foil **layer** and a non-**conductive** material wrapped around said first non-**conductive layer** such that the metal foil layers on successive wraps overlap.
6. The magnet assembly of claim 5 wherein the non-conductive material comprises an epoxy and glass composite.
7. The magnet assembly of claim 5 including a second non-**conductive layer** formed around the vapor barrier.
8. The magnet assembly of claim 7 wherein the first and second non-**conductive layers** are formed of a wrapped epoxy and glass composite material.
9. The magnet assembly of claim 1 including a flange formed on each end of...

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39/TI,PN,PD,PR,K/4 (Item 4 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

Gradient coils
Gradientenspule
Bobine a gradient
PATENT (CC, No, Kind, Date): EP 629874 B1 011017 (Basic)
PRIORITY (CC, No, Date): US 80564 930621

...ABSTRACT A1
A **magnetic resonance** imaging machine includes a toroidal vacuum dewer (24) which contains a superconducting magnet (10). A radio frequency coil (32) is mounted within a cylindrical bore...

...coil windings are limited to a maximum width. Conductive islands (80) defined in the lower current density areas which are large enough to support detrimental **eddy currents** are preferably removed or at least modified such that their ability to support detrimental **eddy currents** is curtailed. (see image in original document)

...CLAIMS A1
1. A **magnetic resonance** imaging apparatus comprising: a generally toroidal magnet assembly (10, 14, 16, 18, 20, 22, 24, 26) for generating a temporally constant magnetic field through an...
...64); a radio frequency coil assembly (30) disposed within the bore for transmitting radio frequency pulses into the examination region (12) for inducing a manipulating **magnetic resonance** of selected dipoles within the examination region (12); a sequence control means (100) for controlling the gradient coil assembly (40) and the radio frequency coil assembly (30) for generating **magnetic resonance** imaging gradient and RF pulse sequences; an image reconstruction means (110) for reconstructing image representations from the **magnetic resonance** signals emanating from the examination region (12).

...gradients within an examination region, the gradient coil assembly comprising: a plurality of electrically interconnected coil constructions, each of the coil constructions including: an electrically **conductive layer** which is divided by cut lines into a generally spiral electrically conductive winding pattern, the winding having: at least one low current density region
23. A method according to claim 21 further including removing the islands to prevent **eddy currents** from being supported therein.
24. A method according to claim 21 further including modifying the islands to reduce the island's ability to support **eddy currents**.

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39/TI,PN,PD,PR,K/5 (Item 5 from file: 348)


**Magnetic resonance** apparatus and methods
Vorrichtung und Methoden fur magnetische Resonanz
Appareil et methodes de resonance magnetiques
PATENT (CC, No, Kind, Date): EP 562707 A1 930929 (Basic)
EP 562707 B1 980520
PRIORITY (CC, No, Date): US 859154 920327

**Magnetic resonance** apparatus and methods

...ABSTRACT A1
In a **magnetic resonance** apparatus an examination region (12) is defined within the bore of a superconducting magnet assembly (10). An RF coil (22) and gradient magnetic field coils...

...the superconducting magnets and the examination region. These cylindrical portions each include a cylinder (70) of an electrically insulating material such as reinforced plastic. Thermally **conductive layers** (72) are defined on each cylinder and are divided by etched slots or resistance portions (74) into a multiplicity of elongated narrow segments (80, 92...
...such as copper or aluminum, that also happens to be electrically conductive. The division of the layers into a multiplicity of segments divides the generated **eddy currents** into a like multiplicity of substantially canceling **eddy currents** (82) increasing the **eddy current** path length, increasing the total electrical resistance encountered, and reducing the amplitude and time constant of the resultant net **eddy current** and **eddy** magnetic field.
(see image in original document)

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39/TI,PN,PD,PR,K/6 (Item 6 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

**Magnetic resonance** imaging apparatus
Apparat zur Bilderzeugung mittels magnetischer Resonanz
Appareil d'imagerie par resonance magnetique
PATENT (CC, No, Kind, Date): EP 430104 A2 910605 (Basic)
EP 430104 A3 911030
EP 430104 B1 980415
PRIORITY (CC, No, Date): JP 89308547 891128

**Magnetic resonance** imaging apparatus

...ABSTRACT A2
In a **magnetic resonance** imaging apparatus, a radiofrequency shielding body (20), which is disposed between the gradient magnetic field generating coils (12) and the radio-frequency coil (13) for...
..radio-frequency coil means (13) resulting from a radio-frequency pulse applied to said radio-frequency coil means (13) and reduce a time constant of **eddy currents** generated in the surface of said gradient magnetic field generating coil means (12; 12a, 12b, 12c), characterized in that said radio-frequency shielding body (20, 32, 45) has been formed by evaporating or plating a continuous **layer** (20B) of a **conductive** material on an insulating base (20A), the conductive material having a thickness less than 1/(pi) fo (mu) (sigma) where: (pi) is a constant equal...

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39/TI,PN,PD,PR,K/7 (Item 1 from file: 349)


METHOD OF INTERNAL **MAGNETIC RESONANCE** IMAGING AND SPECTROSCOPIC ANALYSIS AND ASSOCIATED APPARATUS

English Abstract

The invention provides a method for **magnetic resonance** imaging and spectroscopic analysis of the interior of a specimen (4) which includes positioning the specimen within a main magnetic field, introducing an invasive probe...

31 The method of claim I including
said electrical conductors in said coil being helically intertwined with each other, whereby induction of undesired **eddy currents** is resisted.

34 The method of claim 19 including
employing as said Faraday shield a plurality of electrically **conductive** ring-like **elements** secured to the dielectric material ...spaced position from adjacent said ring-like elements.
conductive strips separated by a plurality of insulating channels;
an insulating layer separating said inner main layer and outer main layer,
wherein, to reduce **eddy current** losses at said lower frequencies, substantially all of said conductive strips have widths of less than three inches.

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44/TI,PN,PD,PR,K/1 (Item 1 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

Magnetic **gradient coil** set for nuclear **magnetic resonance** system having substantially different coil-patient spacings.
PRIORITY (CC, No, Date): US 105738 871007
Magnetic **gradient coil** set for nuclear **magnetic resonance** system having substantially different coil-patient spacings.

...ABSTRACT A2
In a **gradient coil** set for a **magnetic resonance** system, the y **gradient coils** 102, 104 are located substantially closer to the patient than are the x and z **gradient coils**. As a result, one may design the y **gradient coils** to produce a stronger y gradient, to have reduced inductance or otherwise better tailor the magnetic/electrical properties of the **gradient coil** set for **MRI** imaging sequences. In the exemplary embodiment, at least portions of the y **gradient coils** have a first spacing from the z-axis while the x and z **gradient coils** have a second substantially larger spacing from the z-axis. Furthermore, while the x and z **gradient coils** are centered about the z-axis in the patient access space, alternate sides of the y **gradient coil** set are centered about respectively off-set centers C ( sub(y)), C(min)( sub(y)) vertically displaced from the z-axis center of the patient...
.defining a patient access space therewithin along the z-axis which has a cross section perpendicular to the Z-axis with horizontal dimensions which are **substantially greater** than its vertical dimensions.

2. A **magnetic resonance imaging** system having an assembly of **magnetic gradient coils** as **in claim 1** which is disposed within a **static magnetic field** generating structure and electrically connected to **MRI** drive and **control circuit means** for passing **a predetermined** sequence of **current pulses** through said **gradient coils** during an **MRI imaging** sequence.
3. An assembly of magnetic **gradient coils as in** claim 1 wherein:
x and z **gradient coil** segments are located at approximately equal distances from **said z**-axis; and
at least some y **gradient coil** segments are located substantially closer to said **z-axis** than are said x and z-**gradient coil** segments.
4. An assembly of magnetic **gradient coils** as in claim 1
An assembly as in **claim 1** further **characterized** by:
a z-axis **gradient coil** having **coil** segments disposed for creating **a gradient along** said z-axis in a **static magnetic field directed along** said **z**-axis;
an x-axis **gradient coil** having **coil** segments

disposed for creating **a gradient along** said x-axis **in said static magnetic field;**

a y-axis **gradient coil** having **coil** segments disposed for creating **a gradient along** said z-axis in said **static magnetic field;**

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47/TI,PN,PD,PR,K/1 (Item 1 from file: 348)


**Gradient coil** system for a therapy tomograph

...ABSTRACT Translated)
A nuclear **magnetic resonance** (**NMR**) measuring device, particularly an **NMR** tomography device, having a preferably superconductive main **field** coil which can generate a **homogeneous static magnetic field** B0)) in the direction of the z axis of the coordinate system in a measurement volume, the centre of which coincides with a coordinate origin of a cartesian system of x, y, z coordinates, and having a tesseral **gradient coil** system for generating magnetic gradient fields with an essentially linear extent in the measurement volume in a direction perpendicular to the z axis, the **gradient coil** system consisting of at least four essentially identical saddle-like part-coils arranged symmetrically with radial and axial spacing from the coordinate origin, which coils...

...22) being connected to one another by means of conductor sections (23). This arrangement achieves unimpeded lateral access to the volume under examination in the **NMR** measuring device, maintaining adequate linearity of the generated gradient fields in the measuring volume.

CLAIMS 1. Nuclear spin resonance (**NMR**) measuring device, in particular **NMR** tomography apparatus with a preferentially superconducting main field coil which, in a measuring volume whose center coincides with a coordinate origin of a Cartesian x, y, z coordinate system, can produce a **homogeneous static magnetic field** B0)) in the direction of the z-axis of the coordinate system, and with a tesseral **gradient coil** system for the production of magnetic gradient fields with largely linear dependence, in a direction perpendicular to the z-axis, within the measuring volume, whereby the **gradient coil** system consists of at least four largely equal, saddle-like partial coils which are arranged symmetrically with radial and axial separations from the coordinate origin...

...as well as a gap g in the axial direction about the coordinate origin whereby: 1.6 g ≤ dB)) ≤ 2.1 g.

2. **NMR** measuring device according to claim 1, characterised in that the axial separation gg in the z-direction of two partial coils (20) which lie mirror-symmetrically to the xy-plane opposite to each other is approximately equal to the width of the gap g.
3. **NMR** measuring device according to claim 2, characterised in that 2 r2)) is slightly smaller than dB)).
4. **NMR** measuring device according to one of the preceding claims, characterised in that the value of the radial separation 2 r1)) of the azimuthal segments (21...

8. **NMR** measuring device according to one of the preceding claims, characterised in that, for each partial coil (20), a **compensation** coil (30) is provided which, in the axial vicinity

of the radially inner segment (21) of the partial coil (20), exhibits an azimuthal inner segment...

18. NMR measuring device according to one of the preceding claims, characterised in that two sets of x-, y-**gradient coils** are provided for, which are displaced relative to each other about the z-axis by 90(degree) with each set comprising four partial coils

22. NMR measuring device according to one of the preceding claims, characterised in that the **gradient coils** (14, 20) and if necessary also the **compensation** (30), shielding (15), and cylindrical coils (40) are potted in plastic within a support body so that an axial bore about the z-axis remains open which is suitable for the acceptance of a person.

..1b) so that an opening angle for a transverse access opening to the investigational volume is defined which runs transversely to the direction of the **homogeneous** magnetic field and between the inner field coils (1a, 2b).

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47/TI,PN,PD,PR,K/2 (Item 2 from file: 348)
DIALOG(R)File 348:(c) 2002 European Patent Office. All rts. reserv.

Fringe field **MRI**.
Randfeld-Struktur zur Bilderzeugung mittels magnetischer Resonanz.
Structure de champ marginal pour l'imagerie a resonance magnetique.
PATENT (CC, No, Kind, Date): EP 399789 A2 901128 (Basic)
EP 399789 A3 910814
PRIORITY (CC, No, Date): US 354990 890522

Fringe field **MRI**.

...ABSTRACT A2
Extremely non-**homogenous** high but extremely intense high fringe magnetic fields are purposefully (and even advantageously) utilized for **magnetic resonance** imaging (including localization and spectroscopy) so as to better obtain advantages typically associated with ultra high **field MRI**. **Static magnetic field** gradients inherently included in such fringe fields are actively utilized in conjunction with suitable **NMR** RF nutation pulses so as to achieve volume-selective **NMR** data acquisition. Special arrangements of static electromagnets, magnetic **gradient coils** and/or RF coils may be used in conjunction with novel RF/gradient pulse sequences so as to elicit and acquire suitable **MRI** data. ...

...CLAIMS A3
1. A **magnetic resonance** imaging method comprising:
generating a **static**, non-**homogenous**, **magnetic** fringe **field** having an intensity greater than 2 Tesla with a static magnetic gradient in excess of 2 Gauss/cm along a predetermined z-axis through an **MRI** image volume; and
using said static magnetic gradient in conjunction with an **NMR** RF pulse during an **MRI** data acquisition pulse sequence to achieve volume-selective **NMR** nutation of nuclei within said **MRI** image volume

13. A **magnetic resonance** imaging method for acquiring **MRI** image data from an image volume located within a non-**homogeneous static magnetic field** having a substantial **static** gradient with respect to a predetermined z-axis, said method comprising the steps of:

33. **Magnetic resonance** imaging apparatus comprising:
a pair of spaced-apart solenoidal electromagnets having an **MRI** image volume located between their respective bores within a non-**homogeneous static magnetic** fringe **field**;
**magnetic gradient coils** and RF **coils** disposed about said image volume; and
driving and receiving means connected to said **gradient** and RF **coils** for acquiring **MRI** data from said image volume while utilizing, at least in part, said non-**homogeneous** static field to effect volume-selective **NMR** nutations.

34. **Magnetic resonance** imaging apparatus comprising:
a solenoidal electromagnet producing a non-**homogeneous**

**static magnetic** fringe **field** located off-center within its bore proximate one end thereof;
magnetic **gradient** and RF **coils** disposed about an **MRI** image volume disposed within said non-**homogenous** fringe **static magnetic field**; and
driving and receiving means connected to said **gradient** and RF **coils** for acquiring **MRI** data from said image vol

17/05/2002 10/023,163

47/TI,PN,PD,PR,K/3 (Item 1 from file: 349)


**MAGNETIC RESONANCE** SCANNER WITH ELECTROMAGNETIC POSITION AND ORIENTATION TRACKING DEVICE
Priority Application: US 98113782 19981223

English Abstract

A system for combining electromagnetic position and orientation tracking with **magnetic resonance** scanner is provided. One embodiment includes a **magnetic resonance** scanner defining a reference coordinate system for scanning a target. Coupled to the **magnetic resonance** scanner is a magnetic field source which produces a magnetic field. The magnetic field is sensed by a magnetic field sensor which produces a signal...

...sensor has a location relative to the reference coordinate system. The location of the magnetic field sensor relative to the reference coordinate system of the **magnetic resonance** scanner is determined by a location tracking device using at least a line segment model of the magnetic field source and the signal from the...

5 A system according to claim 1, wherein the location tracking device provides field distortion **compensation** within the magnetic field source model.

.second magnetic field sensor having a location relative to the reference coordinate system coupled to a target wherein the target is being scanned by the **magnetic resonance** scanner, wherein the system processor can **compensate** for movement of the target in the output.

12 A system according to claim 11, wherein the location tracking device provides field distortion **compensation** within the magnetic field source model.

29

18 A magnetic **field** source for use in a **magnetic resonance** scanner for generating a **static magnetic field**, the **magnetic field** source comprising: a first loop capable of carrying current in a first direction along the loop wherein the current flows perpendicular to a loop axis...

...first loop, the second loop substantially perpendicular to the loop axis wherein the first current and the second current generate a magnetic field having a **homogeneous** region wherein the direction of the magnetic field in the **homogeneous** region is substantially parallel to the loop axis and the **homogeneous** region is not in between the first loop and the second loop.

17/05/2002 10/023,163

51/TI,PN,PD,PR,K/1 (Item 1 from file: 348)


Magnet assembly in **MRI** instrument
Magnetanordnung in einem Gerat fur die bildgebende magnetische Resonanz
Ensemble d'aimants dans un appareil pour l'imagerie par resonance magnetique

Proposed is an improvement in a magnet assembly of an **MRI** instrument of the permanent magnet type comprising a pair of permanent magnets to face each to the other up and down forming a magnet gap therebetween, a pair of pole pieces each mounted on one of the permanent magnets to face the gap and a pair of **gradient**-field **coils** each mounted on one of the pole pieces to face the gap. With an object to cancel the adverse influences caused by the residual magnetization of the pole pieces by the gradient magnetic field generated in the **gradient**-field **coils**, the invention proposes providing a pair of magnetic-field compensation members each on one of the **gradient** -field **coils** so that the residual magnetization in the compensation members generates a magnetic field which is compensatory for the magnetic field due to the residual magnetization...

(c) a pair of magnetic modulating coils (1A,1B) to generate a gradient **magnetic field** relative to the **static** **magnetic field** generated by the permanent magnets, each of the magnetic modulating coils being mounted on one of the pole pieces to face the magnet gap space...

...magnetic-field compensation members (7A,7B) having a thickness in the range from 0.005 mm to 0.5 mm made from a magnetically soft **ferromagnetic** material, each of the magnetic-field compensation members being mounted on one of the magnetic modulating coils to face the magnetic gap space.

2. The magnet assembly in a **magnetic resonance** imaging instrument as claimed in claim 1 in which the magnetically soft **ferromagnetic**

17/05/2002 10/023,163

53/TI,PN,PD,PR,K/1 (Item 1 from file: 349)


**EDDY CURRENT** CONTROL IN **MAGNETIC RESONANCE**
English Abstract
The scanner includes a **ferromagnetic** frame (122) defining a patient-receiving space (158) adapted to receive a human body. It also includes a pair of opposed polar regions (163, 169...

...magnetically permeable material such as a ferrite, a sintered metal or a metal containing composite, is positioned in each of the polar regions for limiting **eddy current** generation in the polar regions when the gradient producing windings (120) are energized. Each of the layers (326) is oriented generally perpendicular to the polar...

...between said at least one winding and said metallic element.
3 A scanner as claimed in claim 2, wherein said frame includes a pair of **ferromagnetic** pole pieces, each of said pole pieces extending substantially along said polar axis toward the other of said pole pieces, said pole pieces defining said...

...in claim 3, wherein each of said pole pieces includes an inboard end portion adjacent said patient receiving space, and wherein said layers of said **eddy current** limiting means are carried by said inboard end portions of said pole pieces.
18 A scanner as claimed in claim 4, wherein said layers are generally planar and **disk**-shaped in form.
material.
22* A scanner as claimed in claim 21, wherein said layers of magnetically permeable, electrically resistive material are generally planar and **disk**-shaped in form, and wherein said **ferromagnetic** laminations include recessed cylindrical portions which receive said layers therein.

17/05/2002 10/023,163

53/TI,PN,PD,PR,K/2 (Item 2 from file: 349)


APPARATUS FOR HYPERTHERMIA TREATMENT OF CANCER
Priority Application: US 89661 19891122

English Abstract
An apparatus for hyperthermia treatment of cancer comprising a combined hyperthermia applicator/**MRI** probe (1, 6) comprises an **MRI** probe that includes a tuning/matching circuit and a coil (1) for receiving and transmitting **magnetic resonance** signals, the tuning/matching circuit and radio frequency coil (1) being operably connected to one another and the **MRI** probe (1, 6) to be positioned inside a magnet to provide information which permits the control of the amount of radiant energy transmitted by the...
.energy from the
applicator means to the subject's body part to be treated;
wherein all components of the apparatus are made of
substantially non-**ferromagnetic** materials,

10 The apparatus of claim 8, wherein
the antenna comprise copper f ilm of about 5
to 100 Am thick to minimize **eddy currents** during gradient
switching.

17/05/2002  10/023,163

17may02 10:50:12 User267149 Session D93.1

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SYSTEM:OS  - DIALOG OneSearch
  File 155:MEDLINE(R)  1966-2002/May W2
*File 155: This file has been reloaded. Accession numbers have changed.
  File   2:INSPEC  1969-2002/May W2
         (c) 2002 Institution of Electrical Engineers
  File   5:Biosis Previews(R)  1969-2002/May W2
         (c) 2002 BIOSIS
  File   6:NTIS  1964-2002/Jun W1
         (c) 2002 NTIS, Intl Cpyrght All Rights Res
*File   6: See HELP CODES6 for a short list of the Subject Heading Codes
(SC=, SH=) used in NTIS.
  File   8:Ei Compendex(R)  1970-2002/May W2
         (c) 2002 Engineering Info. Inc.
  File  73:EMBASE  1974-2002/May W2
         (c) 2002 Elsevier Science B.V.
*File  73: For information about Explode feature please
see Help News73.
  File  94:JICST-EPlus  1985-2002/Mar W4
         (c)2002 Japan Science and Tech Corp(JST)
*File  94: There is no data missing. UDs have been adjusted to reflect
 the current months data. See Help News94 for details.
  File  35:Dissertation Abs Online  1861-2002/Apr
         (c) 2002 ProQuest Info&Learning
  File 144:Pascal  1973-2002/May W2
         (c) 2002 INIST/CNRS
  File 238:Abs. in New Tech & Eng.  1981-2002/May
         (c) 2002 Reed-Elsevier (UK) Ltd.
  File 105:AESIS  1851-2001/Jul
         (c) 2001 Australian Mineral Foundation Inc
*File 105: This file is closed (no updates)
  File  99:Wilson Appl. Sci & Tech Abs  1983-2002/Apr
         (c) 2002 The HW Wilson Co.
  File  58:GeoArchive  1974-2002/Mar
         (c) 2002 Geosystems
  File  34:SciSearch(R) Cited Ref Sci  1990-2002/May W3
         (c) 2002 Inst for Sci Info
  File 434:SciSearch(R) Cited Ref Sci  1974-1989/Dec
         (c) 1998 Inst for Sci Info
  File 292:GEOBASE(TM)  1980-2002/May
         (c) 2002 Elsevier Science Ltd.
  File  89:GeoRef  1785-2002/May B1
         (c) 2002 American Geological Institute
*File  89: Truncate SH codes for a complete retrieval.
  File  65:Inside Conferences  1993-2002/May W2
         (c) 2002 BLDSC all rts. reserv.
  File  77:Conference Papers Index  1973-2002/Mar
         (c) 2002 Cambridge Sci Abs
  File 350:Derwent WPIX  1963-2001/UD,UM &UP=200231
         (c) 2002  Thomson Derwent
*File 350: Please see HELP NEWS 350 for details about U.S. provisional
applications. Also more updates in 2002.
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STIC-EIC 2800  CP4-9C18  Irina Speckhard  308-6559

17/05/2002 10/023,163

File 347:JAPIO Oct/1976-2001/Dec(Updated 020503)
(c) 2002 JPO & JAPIO

17/05/2002 10/023,163

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Set     Items   Description
S1        480   AU=HAM C? OR AU=HAM, C?
S2        270   AU=KONIJN J? OR AU=KONIJN, J?
S3          0   S1 AND S2
S4         18   S1 AND (MRI OR MAGNETIC()RESONAN???? OR MRA OR NMR OR MAGN-
               ETORESONANCE OR PMR OR PROTON()MAGNETIC()RESONAN???? OR MR()I-
               MAG???)
S5          0   S4 AND (SELF()(INDUC??? OR INCREAS??? OR INITIAT??? OR PRO-
               DUC??? OR GENERAT???))
S6          3   S4 AND EDD???(3N)CURRENT? ?
S7          0   S4 AND (CONDUCT?????(3N)(ELEMENT? ? OR DEVIC?? OR LAYER? ?
               OR COMPONENT? ?))
S8         10   S4 AND GRADIENT? ?(3N)FIELD? ?
S9          7   S8 AND GRADIENT? ?(3N)COIL? ?
S10         8   S2 AND (MRI OR MAGNETIC()RESONAN???? OR MRA OR NMR OR MAGN-
               ETORESONANCE OR PMR OR PROTON()MAGNETIC()RESONAN???? OR MR()I-
               MAG???)
S11         0   S10 AND EDD???(3N)CURRENT? ?
S12         1   S10 AND GRADIENT? ?(3N)FIELD? ?
S13         1   S10 AND GRADIENT? ?(3N)COIL? ?
S14         0   S13 NOT S12
S15         0   S10 AND COMPENSAT????
S16         0   S10 AND SUPPRESS????
?
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17/05/2002 10/023,163

6/3,AB/1 (Item 1 from file: 350)
DIALOG(R)File 350:Derwent WPIX


013193286
WPI Acc No: 2000-365159/200031
XRPX Acc No: N00-273294
**Magnetic resonance** imaging apparatus for medical purposes, comprises gradient system comprising **eddy current** shield formed by electrically conductive, substantially closed plate
Patent Assignee: KONINK PHILIPS ELECTRONICS NV (PHIG ); US PHILIPS CORP (PHIG )
Inventor: **HAM C L G**; MATEBOER A J; MULDER G B J; ROOZEN N B; VERBUNT J P M
Number of Countries: 021 Number of Patents: 003
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 6326788 | B1 | 20011204 | US 99428765 | A | 19991028 | 200203 |

Priority Applications (No Type Date): EP 98203650 A 19981028
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 6326788 | B1 | | | G01V-003/00 | |

Abstract (Basic): WO 200025146 A1
Abstract (Basic):
NOVELTY - The gradient system (40) comprises an **eddy current** shield (48) which is formed by an electrically conductive, substantially closed plate. A primary gradient coil (60) and a shielding coil (56) are arranged within the shield and they constitute a mechanically rigid unit.
DETAILED DESCRIPTION - The gradient system (40) is arranged in the evaluated space (38). The **eddy current** shield (48) is made of aluminum or copper. The time constant for **eddy currents** of the **eddy current** shield is greater than the pulse duration of the gradient current pulses driving the gradient system.
USE - For medical purposes for forming images of cross sections of the body.
ADVANTAGE - As the electrically conductive **eddy current** shield is formed from a substantially closed plate in which two coils are arranged, the escape of magnetic flux to the environment is prevented, avoiding heat dissipation and production of noise in the main field magnet.
DESCRIPTION OF DRAWING(S) - The figure shows the construction of the gradient coil system.
Space (38)
Gradient system (40)
**Eddy current** shield (48)
Shielding coil (56)
Primary gradient coil (60)
pp; 17 DwgNo 2/2

6/3,AB/2 (Item 2 from file: 350)
DIALOG(R)File 350:Derwent WPIX


012588767
WPI Acc No: 1999-394874/199933
XRPX Acc No: N99-295163
**Magnetic resonance** apparatus with force-optimized gradient coils
Patent Assignee: KONINK PHILIPS ELECTRONICS NV (PHIG ); PHILIPS AB (PHIG ); US PHILIPS CORP (PHIG )
Inventor: **HAM C L G**
Number of Countries: 020 Number of Patents: 004
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 6147494 | A | 20001114 | US 98198934 | A | 19981124 | 200060 |

Priority Applications (No Type Date): EP 97203727 A 19971128
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 6147494 | A | | | G01V-003/00 | |

Abstract (Basic): WO 9928757 A1
Abstract (Basic):
NOVELTY - A magnetic system includes a cylindrical electromagnetic inner coil system (37) enclosing a receiving space (39) and a circular measuring space (29), while the coil system generates a substantially uniform steady magnetic field in the measuring space. The coil system and an outer coil system (41) are rotated symmetrically relative to a central axis (35) in a helium vessel (49) filled with liquid helium. The system is provided with radiation shielding (63,65) limiting heat transfer and generating **eddy currents**, while being surrounded by vacuum spaces to eliminate transfer of acoustic vibrations
USE - **Magnetic resonance** imaging
ADVANTAGE - Optimizing gradient coil system by shielding coils
DESCRIPTION OF DRAWING(S) - The drawing is a longitudinal sectional view of coil system in **magnetic resonance** apparatus according to the invention
Inner and outer coil systems (37,41)
Receiving space (39)
Measuring space (29)
Helium vessel (49)
Radiation shielding (63,65)
pp; 25 DwgNo 2/5

6/3,AB/3 (Item 3 from file: 350)
DIALOG(R)File 350:Derwent WPIX


007790453
WPI Acc No: 1989-055565/198908
XRPX Acc No: N89-042328
Improved gradient coil system **magnetic resonance** apparatus - has radially spaced arc conductors allowing higher patient accessibility
Patent Assignee: PHILIPS GLOEILAMPENFAB NV (PHIG )
Inventor: **HAM C L G**; OVERWEG J A
Number of Countries: 007 Number of Patents: 006
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 4878023 | A | 19891031 | US 88233310 | A | 19880817 | 199002 |

Priority Applications (No Type Date): NL 871948 A 19870819
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 4878023 | A | | 6 | | |

Abstract (Basic): EP 304126 A

In the **magnetic resonance** apparatus arc conductors which contribute less to the field formation and which are situated further outwards are radially and/or axially positioned in a gradient coil system so that they compensate for stray fields of arc conductors which are more centrally situated and which contribute to the field formation. As a result of the radial displacement, the measuring space of the apparatus can be conically shaped, so that a higher patient accessibility is achieved or a smaller diameter can be imparted to a central portion.

Because no additional compensation coils are used and **eddy currents** are still prevented in electrically conductive shields enclosing the coil system, the power stored in the coil system is reduced.

ADVANTAGE - Control of coil system is improved notably for higher frequencies

9/3,AB/1 (Item 1 from file: 350)
DIALOG(R)File 350:Derwent WPIX


014213336
WPI Acc No: 2002-034034/200204
XRPX Acc No: N02-026238
**Magnetic resonance** imaging apparatus for medical purposes, has RF shield arranged in vacuum isolated space between **gradient coil** system and RF coil
Patent Assignee: KONINK PHILIPS ELECTRONICS NV (PHIG )
Inventor: **HAM C L G**
Number of Countries: 020 Number of Patents: 002
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| EP 1137954 | A1 | 20011004 | EP 2000966004 | A | 20000913 | 200204 |
| | | | WO 2000EP8972 | A | 20000913 | |

Priority Applications (No Type Date): EP 99203124 A 19990923
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| WO 200122109 | A1 | E | 11 | G01R-033/385 | |

Abstract (Basic): WO 200122109 A1
Abstract (Basic):

NOVELTY - A **gradient coil** system (3) arranged in a vacuum isolated space (39) generates a magnetic **gradient field** in an imaging volume (29). A RF coil (9) which partly encloses the image volume, generates RF magnetic alternating field in the imaging volume. A RF shield (47) is arranged in the vacuum isolated space between the **gradient coil** system and RF coil.

USE - For medical purposes.

ADVANTAGE - By providing RF shield in vacuum isolated space between **gradient coil** system and RF coil, power loss is minimized and thus RF power is utilized efficiently.

DESCRIPTION OF DRAWING(S) - The figure shows the positioning of main, **gradient** and RF **coils** and RF shield in the **magnetic resonance** imaging apparatus.

**Gradient coil** system (3)
RF coil (9)
Imaging volume (29)
Isolated space (39)
RF shield (47)
pp; 11 DwgNo 2/2

17/05/2002 10/023,163

9/3,AB/2 (Item 2 from file: 350)
DIALOG(R)File 350:Derwent WPIX


013475067
WPI Acc No: 2000-647010/200062
XRPX Acc No: N00-479531
Compensation signal determination for **MRI** device involves providing compensation signal based on determined characteristic of temperature-dependent magnetic properties of magnetizable material
Patent Assignee: KONINK PHILIPS ELECTRONICS NV (PHIG )
Inventor: **HAM C L G**; MULDER G B J
Number of Countries: 020 Number of Patents: 002

Abstract (Basic): WO 200054069 A1
Abstract (Basic):
NOVELTY - The method involves determining at least one characteristic of the temperature-dependent magnetic properties of a magnetizable material which interacts with the magnetic **fields** generated by a **gradient field coil**. A compensation signal is provided based on the determined characteristic of the temperature-dependent magnetic properties of a magnetizable material.
USE - For determination of compensation signal used for compensation of temporarily varying field strength of main magnetic field of main magnet of **magnetic resonance** imaging device. Also applicable to device for spectroscopy.
ADVANTAGE - Enables compensation of variations of field strength of main magnetic field for imaging result during use of frequency of radio-frequency oscillator in **MRI** device. Enables eliminating variations of field strength affecting quality of an image, by generating compensation signal.
DESCRIPTION OF DRAWING(S) - The figure shows the diagram explaining the determination of compensation signal from various measured quantities.

9/3,AB/3 (Item 3 from file: 350)
DIALOG(R)File 350:Derwent WPIX


013178556
WPI Acc No: 2000-350429/200030
XRPX Acc No: N00-262585
**Magnetic resonance** imaging apparatus for medical purposes has correction coil which generates **gradient field** with linearity given by specific ratio greater than unity
Patent Assignee: KONINK PHILIPS ELECTRONICS NV (PHIG ); US PHILIPS CORP (PHIG )
Inventor: **HAM C L G**; MULDER G B J; PEEREN G N
Number of Countries: 021 Number of Patents: 003
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 6236208 | B1 | 20010522 | US 99421647 | A | 19991020 | 200130 |

Priority Applications (No Type Date): EP 98203540 A 19981020
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 6236208 | B1 | | | G01V-003/00 | |

Abstract (Basic): WO 200023812 A1
Abstract (Basic):
NOVELTY - The switching units (58,60,62,64) connect a **gradient coil** (32) and a correction coil (36) either in series or to corresponding drive amplifiers (54,56) as desired. Each drive amplifier drives the corresponding **coil** for generating a **gradient field**. The linearity of the **gradient field** generated by the correction coil is given by the ratio R=maxdev/ maxlin, which is greater than one.
DETAILED DESCRIPTION - The linearity of the **gradient field** is R=maxdev/maxlin, where maxdev is maximum value of the deviation of the linear component and maxlin is maximum value of the linear component.
USE - For medical purposes.
ADVANTAGE - Capable of producing high degree of linearity as well as high speed.
DESCRIPTION OF DRAWING(S) - The figure shows the circuit diagram of **magnetic resonance** imaging apparatus.
**Gradient coil** (32)
Correction coil (36)
Drive amplifiers (54,56)
Switching units (58,60,62,64)
pp; 31 DwgNo 7/7

9/3,AB/4 (Item 4 from file: 350)
DIALOG(R)File 350:Derwent WPIX


010294514
WPI Acc No: 1995-195774/199526
XRPX Acc No: N95-153690
**Magnetic resonance** imaging appts. for sound reproduction - delays microphone signal for given period of time and attenuates noise which does not originate from sound reproducer
Patent Assignee: PHILIPS ELECTRONICS NV (PHIG ); KONINK PHILIPS ELECTRONICS NV (PHIG ); US PHILIPS CORP (PHIG )
Inventor: **HAM C L G**
Number of Countries: 007 Number of Patents: 006
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 5552708 | A | 19960903 | US 94347012 | A | 19941130 | 199641 |

Priority Applications (No Type Date): BE 931319 A 19931130
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 5552708 | A | | 7 | G01R-033/28 | |

Abstract (Basic): EP 655730 A
The **magnetic resonance** imaging appts. includes a signal delay device between a microphone and a summing device. It delays the microphone signal for a given period of time. A sound reproducing device attenuates sound which does not originate from itself. The sound reproduction device includes a headset with a pair of earphones which are embedded in a sound absorbing material.
The sound reproducer includes an electro-acoustic transducer outside of a measuring space. The transducer is acoustically connected via an air filled tubular connector to sound reproduction members.
ADVANTAGE - Simple. Reduces excess noise due to good cancellation.
Dwg.2/2
Abstract (Equivalent): US 5552708 A
A **magnetic resonance** imaging apparatus, comprising a magnet system for generating a steady magnetic field in a measuring space, a **gradient** coil system for generating **gradient fields** in the measuring space, a power supply source for the **gradient coils**, and a communication system for transferring voice sound information from a first region in which the level of gradient noise generated by the **gradient coils** is comparatively high to a separate second region, which communication system comprises means for generating a reference signal which is dependent on the gradient noise, a microphone which is arranged in the first region so as to pick up a mixture of voice sound information desired to be communicated to the second region and gradient noise, a sound reproduction device, at least a part of which is situated in the second region, and a noise suppression device which comprises a filter device for modeling the acoustic path from the **gradient coils** to the microphone for converting the reference signal into a signal which corresponds substantially to the gradient noise at the area of the microphone, and a summing device for adding the output

signal of the filter device to the output signal of the microphone in phase opposition, the output of the summing device being connected to the sound reproduction device to reproduce the voice sound information, characterized in that between the microphone and the summing device there is provided signal delay means for delaying the microphone signal for a predetermined period of time, and that the sound reproduction device comprises a sound reproduction member surrounded by sound-absorbing material for attenuating ambient sounds in the second region more than sounds which originate from the sound reproduction member.

9/3,AB/5 (Item 5 from file: 350)
DIALOG(R)File 350:Derwent WPIX


009880648
WPI Acc No: 1994-160562/199420
XRPX Acc No: N94-126314
**Magnetic resonance** appts. e.g. for human body examination - derives noise cancellation signal from gradient signal generator which powers **gradient coils**
Patent Assignee: PHILIPS ELECTRONICS NV (PHIG ); US PHILIPS CORP (PHIG )
Inventor: **HAM C L G**; MEHLKOPF A F
Number of Countries: 005 Number of Patents: 004
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 5481192 | A | 19960102 | US 93150655 | A | 19931110 | 199607 |

Priority Applications (No Type Date): EP 92203435 A 19921110
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 5481192 | A | | 10 | G01V-003/00 | |

Abstract (Basic): EP 597528 A
The **magnetic resonance** appts. includes a magnet system which generates a steady magnetic field in a measuring space. A **gradient** coil system generates **gradient fields** in the space. The **gradient coils** are powered by a gradient signal generator and several amplifiers. A noise canceller generates a sound signal which is in phase opposition with a sound signal generated by the **gradient coils** in a region of silence.
The noise canceller derives its sound signal partly from the gradient signal generator. The gradient signal generator produces a signal to control the sound signal, and a second signal to control the **gradient fields**. The first signal anticipates the second.
ADVANTAGE - Quicker response, improved noise cancellation.
Dwg.1/3
Abstract (Equivalent): EP 597528 B
The **magnetic resonance** appts. includes a magnet system which generates a steady magnetic field in a measuring space. A **gradient** coil system generates **gradient fields** in the space. The **gradient coils** are powered by a gradient signal generator and several amplifiers. A noise canceller generates a sound signal which is in phase opposition with a sound signal generated by the **gradient coils** in a region of silence.
The noise canceller derives its sound signal partly from the gradient signal generator. The gradient signal generator produces a signal to control the sound signal, and a second signal to control the **gradient fields**. The first signal anticipates the second.
ADVANTAGE - Quicker response, improved noise cancellation.

9/3,AB/6 (Item 6 from file: 350)
DIALOG(R)File 350:Derwent WPIX


009057965
WPI Acc No: 1992-185347/199223
XRPX Acc No: N92-139920
**Magnetic resonance** appts. - uses arc conductors and screening conductors connected in series with Z-field coil in association with stationary magnetic field
Patent Assignee: PHILIPS GLOEILAMPENFAB NV (PHIG ); US PHILIPS CORP (PHIG )
Inventor: **HAM C L G**; MENS W R M
Number of Countries: 005 Number of Patents: 003
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 5256970 | A | 19931026 | US 91797847 | A | 19911126 | 199344 |

Priority Applications (No Type Date): NL 902574 A 19901127
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 5256970 | A | | 6 | G01V-003/00 | |

Abstract (Basic): EP 488445 A
The appts. comprises a magnet system (2) and supply source (6) which produce a stationary magnetic field and a magnet system (4) with supply source (6) which produces an x-, y-, z- **gradient field** adapted to the geometry of objects to be examined. The coil systems have coil packets comprising field arc conductors and a screening conductor with additional arc conductors constituting a magnetic coil which produces an additive Bo field that can be activated in synchronism with a z-**gradient coil** system and which is connected in series with the z coil.
The additive arc conductors cause an axial displacement of a linearity range in the z-**gradient field** from the centre of the stationary magnetic **field**. Shielding of the **gradient coil** system by return arc conductors allows a **gradient field** operating range displaced in any direction to be obtained.
ADVANTAGE - Produces strong rapidly switchable **gradient fields** for advanced high resolution resonance imaging techniques.
Abstract (Equivalent): US 5256970 A
In a **magnetic resonance** apparatus, a coil system is added to a **gradient coil** system, as a result of which a measuring field range is adapted to the geometry of an object to be examined. For example, by addition of a Bo coil system to be activated simultaneously with the z-gradient system, an asymmetry is realised in the z-**gradient field**.
Further, by addition of additional arc conductors, the z-gradient linearity range is displaced in the z-direction. The further coil is selectively driven in synchronism with at least one of the **gradient coils**, where the linearity range of the **gradient coil** is displaced in space.
ADVANTAGE - Return of disturbing resonance signals from object part located outside **gradient field** operating range is avoided.

9/3,AB/7 (Item 7 from file: 350)
DIALOG(R)File 350:Derwent WPIX


007790453
WPI Acc No: 1989-055565/198908
XRPX Acc No: N89-042328
Improved **gradient coil** system **magnetic resonance** apparatus - has radially spaced arc conductors allowing higher patient accessibility
Patent Assignee: PHILIPS GLOEILAMPENFAB NV (PHIG )
Inventor: **HAM C L G**; OVERWEG J A
Number of Countries: 007 Number of Patents: 006
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 4878023 | A | 19891031 | US 88233310 | A | 19880817 | 199002 |

Priority Applications (No Type Date): NL 871948 A 19870819
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| US 4878023 | A | | 6 | | |


Abstract (Basic): EP 304126 A

In the **magnetic resonance** apparatus arc conductors which contribute less to the field formation and which are situated further outwards are radially and/or axially positioned in a **gradient coil** system so that they compensate for stray fields of arc conductors which are more centrally situated and which contribute to the field formation. As a result of the radial displacement, the measuring space of the apparatus can be conically shaped, so that a higher patient accessibility is achieved or a smaller diameter can be imparted to a central portion.

Because no additional compensation coils are used and eddy currents are still prevented in electrically conductive shields enclosing the coil system, the power stored in the coil system is reduced.

A **magnetic resonance** apparatus comprising a magnet system (2) for generating a steady magnet field parallel to a central (z) axis in a measurement space (28) and a **gradient coil** system (4) for selectively generating a **gradient** magnetic **field** in said measurement space superimposed on said steady magnetic field, said coil system comprising electrically series-connected effective (44, 54) and return (46, 56) arc conductors lying in planes intersecting said central axis (z), said effective arc conductors (44, 54) contributing more substantially to the generation of said **gradient** magnetic **field** than said return arc conductors (46, 56), characterised in that said return arc conductors (46, 56) are positioned to compensate for stray magnetic fields generated by said effective arc conductors (44, 54). (Dwg.1/3)

17/05/2002 10/023,163

12/3,AB/1 (Item 1 from file: 350)
DIALOG(R)File 350:Derwent WPIX


008254292
WPI Acc No: 1990-141293/199019
XRPX Acc No: N90-109565
**Magnetic resonance** appts. with optimised detection field - deflects axial conductors away from cylindrical surface by connecting LC circuits across current conductors
Patent Assignee: PHILIPS GLOEILAMPENFAB NV (PHIG )
Inventor: **KONIJN J**; MENS W
Number of Countries: 006 Number of Patents: 003
Patent Family:

| Patent No | Kind | Date | Applicat No | Kind | Date | Week |
|---|---|---|---|---|---|---|
| US 5019778 | A | 19910528 | US 89426335 | A | 19891024 | 199124 |

Priority Applications (No Type Date): NL 882609 A 19881024
Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|---|---|---|---|---|---|
| EP 367327 | A | | | | |

Designated States (Regional): DE FR GB IT

Abstract (Basic): EP 367327 A

The **magnetic resonance** apparatus comprises a magnet system for generating a uniform, steady magnetic field, a magnet system (4) for generating magnetic **gradient fields**, and power supply forces (6 and 8) for the magnet system (2) and the magnet system respectively. A magnet coil (10) for generating generating an rf magnetic field is connected to an rf source (12). The coil can also be used for the detection of **magnetic resonance** signals generated by the rf transmitted field in an object to be examined: to this end it is connected to a signal amplifier (14).

The signal amplifier is connected to a phase sensitive rectifier (16) which is connected to a central control device (18). The central control device also controls a modulator (20) for the rf source, the power supply source for the gradient coils, and a monitor (22) for display. An rf oscillator 24 controls the modulator as well as the phase sensitive rectifier which processes the measurement signals.

ADVANTAGE - Enhanced homogeneity in non-central transverse planes.

Dwg.1/4

Abstract (Equivalent): US 5019778 A

The rf coil of a **magnetic resonance** apparatus steps are taken to optimise a uniform rf measuring field. Axially extending current conductors are provided with a device for generating a non-constant effective current intensity in current paths extending across a cylindrical surface so as to be parallel with a symmetry axis of the coil. This can be realised by deflecting axial conductors away from the cylindrical surface, by partly shielding them, by adding auxiliary coils to be individually controlled, or by connecting L-C circuits across the current conductors. ADVANTAGE - Improved sensitivity.

WEST

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**Search Results -**

| Terms | Documents |
|---|---|
| L25 NOT L23 | 3 |

Database: US Patents Full-Text Database; US Pre-Grant Publication Full-Text Database; JPO Abstracts Database; EPO Abstracts Database; Derwent World Patents Index; IBM Technical Disclosure Bulletins

Search: 10/023,163 BEST OF PLUS

Refine Search | Recall Text | Clear

## Search History

**DATE: Friday, May 17, 2002** Printable Copy Create Case

| Set Name side by side | Query | Hit Count | Set Name result set |
|---|---|---|---|
| *DB=DWPI; PLUR=YES; OP=OR* | | | |
| L26 | L25 NOT L23 | 3 | L26 |
| L25 | L24 NOT L22 | 3 | L25 |
| L24 | L20 NOT L21 | 4 | L24 |
| L23 | L22 NOT L21 | 1 | L23 |
| L22 | L20 AND COMPENSAT$4 | 1 | L22 |
| L21 | L20 AND SUPPRESS$5 | 1 | L21 |
| L20 | L6 AND (MAGNETIC NEAR3 FIELD?) | 5 | L20 |
| L19 | L6 AND (CURRENT? NEAR3 PULSE?) | 1 | L19 |
| L18 | L6 AND CC=(A7550B OR B3110C) | 0 | L18 |

| | | | |
|---|---|---|---|
| L17 | L6 AND (CONTROL$5 NEAR3 CURRENT? NEAR3 PULS?) | 0 | L17 |
| L16 | L15 AND (CONTROL$5 NEAR3 CURRENT? NEAR3 PULS?) | 0 | L16 |
| L15 | L6 AND ((STATIC OR STEADY ADJ STATE)NEAR3 MAGNETIC NEAR3 FIELD?) | 0 | L15 |
| L14 | L13 NOT L8 | 2 | L14 |
| L13 | L6 AND HOMOGEN$5 | 2 | L13 |
| L12 | L6 AND CC=(A4110D OR A4110F OR B5100 OR B5120) | 0 | L12 |
| L11 | L6 AND (GRADIENT? NEAR3 COIL?) | 0 | L11 |
| L10 | L3 AND (GRADIENT? NEAR3 FIELD?) | 0 | L10 |
| L9 | L6 AND (GRADIENT? NEAR3 FIELD?) | 0 | L9 |
| L8 | L6 AND CONDUCTOR? | 2 | L8 |
| L7 | L6 AND (CONDUCT$5 NEAR3 (ELEMENT? OR DEVIC? OR LAYER? OR COMPONENT?)) | 0 | L7 |
| L6 | L3 AND (EDD$3 NEAR3 CURRENT?) | 22 | L6 |
| L5 | L3 AND (SELF ADJ (INDUC$3 OR INCREAS$3 OR INITIAT$3 OR PRODUC$3 OR GENERAT$3)) | 0 | L5 |
| L4 | L3 AND ((THREE OR MULTIPLE OR MULTI OR SEVERAL OR ARRAY) NEAR2 GRADIENT? NEAR3 COIL?) | 0 | L4 |
| L3 | L2 AND CC=A0758 | 56 | L3 |
| L2 | L1 AND (MRI OR MAGNETIC NEAR RESONAN$5 OR MRA OR NMR OR MAGNETORESONANCE OR PMR OR PROTON NEAR MAGNETIC NEAR RESONAN$5 OR MR NEAR IMAG$3) | 56 | L2 |
| L1 | 4876510 5280247 5289128 5396173 4590428 4864241 6163240 6157276 4763076 5304932 5367261 5406204 5488299 5572129 5680086 5706575 6147494 6326788 6023167 6100695 5457387 5886596 5990681 5736858 6054854 5424643 4878023 5742164 6078177 6100692 6232548 4609425 4920316 4978920 4993043 5243286 5309103 5483043 5550472 5680046 5760584 4833434 4857848 6218836 6218836 5986452 5406205 5581187 4924186 5025217 | 75 | L1 |

END OF SEARCH HISTORY

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L8: Entry 1 of 2 File: DWPI Sep 23, 1992

DERWENT-ACC-NO: 1992-318433
DERWENT-WEEK: 199824


TITLE: Coil arrangement in nuclear magnetic resonance appts. - has pair of coils positioned around cylindrical volume diametrically opposite one another for imposing gradient on volume

INVENTOR: HAJNAL, J V; HALL, A S ; MORICH, M A ; PATRICK, J L ; PETROPOULOS, L ; DEMEESTER, G D

PRIORITY-DATA: 1990GB-0026924 (December 12, 1990), 1993US-0080564 (June 21, 1993)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| GB 2253909 A | September 23, 1992 | | 015 | G01R033/38 |
| US 5278504 A | January 11, 1994 | | 014 | G01V003/00 |
| GB 2253909 B | September 28, 1994 | | 000 | G01R033/38 |
| US 5424643 A | June 13, 1995 | | 010 | G01R033/20 |

INT-CL (IPC): G01R 33/20; G01R 33/38; G01R 33/48; G01V 3/00

ABSTRACTED-PUB-NO: GB 2253909A
BASIC-ABSTRACT:

A coil set in a magnetic resonance appts., for imposing on a magnetic field in a cylindrical volume in which an object to be examined is placed in use of the appts., a gradient in a direction transverse to the axis of the volume.

The coil set effectively comprises a pair of coils correspondingly positioned around the volume diametrically opposite one another. Each of the coils has an axial end portion in which the conductors of the coil are spaced apart axially, and which is radially aligned with the volume.

USE/ADVANTAGE - Coil arrangement in magnetic resonance appts. for use in medical examination of patients, e.g. to provide image representing distribution in selected region of patient, a chosen quantity e.g. nucleon density or MR spin relaxation time constant. Enables coil set to centrally closely fit around patient's head.

t
ABSTRACTED-PUB-NO:

GB 2253909B EQUIVALENT-ABSTRACTS:

A Coil set in a magnetic resonance apparatus for imposing on a magnetic field in a cylindrical volume in which an object to be examined is placed in use of the apparatus a gradient in a direction transverse to the axis of the volume, the coil set effectively comprising a pair of coils correspondingly positioned around said volume diametrically opposite one another, each of said coils having an axial end portion in which the conductors of the coil are spaced apart axially, and which is substantially radially aligned with said volume.

US 5278504A

An x-gradient coil is disposed along a cylindrical surface extending circumferentially around a central axis for generating linear magnetic field gradients across the examination region in a first direction transverse to the central axis. A y-gradient coil is disposed along a cylindrical surface extending circumferentially around the central axis for generating linear magnetic field gradients across the examination region is a second direction transverse to the central axis.

A z-gradient coil is disposed along a cylindrical surface extending circumfernetially around a central axis for generating linear magnetic field gradients across the examination region in a third direction parallel to the central axis. The x,y, and z-gradient coils each have a geometric centre midway between end windings along the central axis. The examination region is displaced along the central axis from at least the x- and y-gradient coil geometric centres. A magnetic resonance signal receives is provided for receiving magnetic resonance signals from the resonating dipoles. A processor is provided for processing the magnetic resonance signals.

USE - Gradient coil with off-centre sweet spot for magnetic resonance imaging.

US 5424643A

The MRI machine includes a toroidal vacuum dewar (24) which contains a superconducting magnet (10). A radio frequency coil (32) is mounted within a cylindrical bore (26) of the vacuum dewar. A cylindrical, dielectric former (46) supports an RF shield (34), a z-gradient coil (50), an x-gradient coil (52), and a y-gradient coil (54). The x and y-gradient coils are each composed of four like spiral coil constructions. A metallic layer is cut with cut lines (64) to define a generally spiral coil winding pattern.

In a high current density region (68) in which the coil windings are narrower than a preselected width, the cut lines (76) are thinner. In lower current density regions (70), the cut lines (78) are thicker. In lower current density regions, two cut lines are defined between adjacent coil windings such that the coil windings are limited to a maximum width. Conductive islands (80) defined in the lower current density areas which are large enough to support detrimental eddy currents are preferably removed or at least modified such that their

ability to support detrimental eddy currents is curtailed.

ADVANTAGE - Reduces eddy currents and power loss in gradient coils. Improves distributions of heat generated by gradient coil.

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**End of Result Set**

Generate Collection Print

L8: Entry 2 of 2 File: DWPI Feb 22, 1989

DERWENT-ACC-NO: 1989-055565
DERWENT-WEEK: 198908


TITLE: Improved gradient coil system magnetic resonance apparatus - has radially spaced arc conductors allowing higher patient accessibility

INVENTOR: HAM, C L G; OVERWEG, J A

PRIORITY-DATA: 1987NL-0001948 (August 19, 1987)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| EP 304126 A | February 22, 1989 | E | 008 | |
| DE 3875863 G | December 17, 1992 | | 000 | G01R033/40 |
| EP 304126 B1 | November 11, 1992 | E | 008 | G01R033/40 |
| JP 01070031 A | March 15, 1989 | | 000 | |
| NL 8701948 A | March 16, 1989 | | 000 | |
| US 4878023 A | October 31, 1989 | | 006 | |

INT-CL (IPC): A61B 10/00; G01N 24/06; G01R 33/12; G01R 33/40; H01F 7/20

ABSTRACTED-PUB-NO: EP 304126A
BASIC-ABSTRACT:

In the magnetic resonance apparatus arc conductors which contribute less to the field formation and which are situated further outwards are radially and/or axially positioned in a gradient coil system so that they compensate for stray fields of arc conductors which are more centrally situated and which contribute to the field formation. As a result of the radial displacement, the measuring space of the apparatus can be conically shaped, so that a higher patient accessibility is achieved or a smaller diameter can be imparted to a central portion.

Because no additional compensation coils are used and eddy currents are still prevented in electrically conductive shields enclosing the coil system, the power stored in the coil system is reduced.

ADVANTAGE - Control of coil system is improved notably for higher frequencies.
ABSTRACTED-PUB-NO:

EP 304126B EQUIVALENT-ABSTRACTS:

In the magnetic resonance apparatus arc conductors which contribute less to the field formation and which are situated further outwards are radially and/or axially positioned in a gradient coil system so that they compensate for stray fields of arc conductors which are more centrally situated and which contribute to the field formation. As a result of the radial displacement, the measuring space of the apparatus can be conically shaped, so that a higher patient accessibility is achieved or a smaller diameter can be imparted to a central portion.

Because no additional compensation coils are used and eddy currents are still prevented in electrically conductive shields enclosing the coil system, the power stored in the coil system is reduced.

ADVANTAGE - Control of coil system is improved notably for higher frequencies.

US 4878023A

The magnetic resonance apparatus has a system for generating a steady magnet field parallel to a central axis in a measurement space. A gradient coil system electively generates a gradient magnetic field in the measurement space superimposed on the steady magnetic field. The coil system has electrically series-connected effective and return art conductors lying in planes intersecting. The effective arc conductors contribute more to the generation of the gradient magnetic field than the return arc conductors. The return arc conductors are positioned to compensation for stray magnetic fields generated by the effective arc conductors.

The return arc conductors of the coil system extend across a cylinder surface having a diameter which is larger than that of the effective arc conductors.

ADVANTAGE - Reduced resultant stray field-higher patient accessibility. (6pp)r

WEST

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L14: Entry 1 of 2 File: DWPI May 8, 2001

DERWENT-ACC-NO: 1996-224028
DERWENT-WEEK: 200128


TITLE: Modular MRI gradient coils for conventional imaging or for ultra-fast imaging - has gradient coils which are longitudinally symmetrical about X and Y axis respectively, which separate them, with secondary coils wound cylindrical former concentric but external to primary coils

INVENTOR: HARVEY, P R; KATZNELSON, E

PRIORITY-DATA: 1994US-0335340 (November 3, 1994), 1996US-0738579 (October 29, 1996)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| JP 3164278 B2 | May 8, 2001 | | 009 | A61B005/055 |
| GB 2295020 A | May 15, 1996 | | 034 | G01R033/385 |
| DE 19540746 A1 | June 5, 1996 | | 012 | G01R033/385 |
| JP 08229023 A | September 10, 1996 | | 041 | A61B005/055 |
| NL 1001573 C2 | September 11, 1996 | | 024 | A61B005/055 |
| US 5736858 A | April 7, 1998 | | 012 | G01V003/00 |
| GB 2295020 B | May 19, 1999 | | 000 | G01R033/385 |

INT-CL (IPC): A61 B 5/055; G01 N 24/08; G01 R 33/36; G01 R 33/385; G01 R 33/42; G01 V 3/00; G01 V 3/14

ABSTRACTED-PUB-NO: GB 2295020A
BASIC-ABSTRACT:

The gradient coils include a magnet for supplying large homogeneous static magnetic field to align spins in a subject within the interior space of magnet, radio frequency transmitter for generating RF signals at Larmor frequencies, RF coil for transmitting RF signals to tip the aligned spins to have at least a projection on a plane normal to static magnetic field, and at least one modular gradient coil set for varying static magnetic field to enable encoding free induction decay (FID) signal emitted by the tipped spins.

The modular gradient coil set includes modular gradient coils, the first of which is constructed and arranged to provide first region within the magnetic field having linear gradients for ultra-fast MRI, and second modular gradient coil arranged to provide a second region within the static magnetic field having linear gradients for

conventional MRI. The second modular gradient coil is constructed and arranged to operate in conjunction with the first to obtain the second region larger than the first.

ADVANTAGE - Exhibits reduced generation of eddy currents within MRI magnetic system, and modular design provides gradient coil of high efficiency and tailored volume.
ABSTRACTED-PUB-NO:

GB 2295020B EQUIVALENT-ABSTRACTS:

The gradient coils include a magnet for supplying large homogeneous static magnetic field to align spins in a subject within the interior space of magnet, radio frequency transmitter for generating RF signals at Larmor frequencies, RF coil for transmitting RF signals to tip the aligned spins to have at least a projection on a plane normal to static magnetic field, and at least one modular gradient coil set for varying static magnetic field to enable encoding free induction decay (FID) signal emitted by the tipped spins.

The modular gradient coil set includes modular gradient coils, the first of which is constructed and arranged to provide first region within the magnetic field having linear gradients for ultra-fast MRI, and second modular gradient coil arranged to provide a second region within the static magnetic field having linear gradients for conventional MRI. The second modular gradient coil is constructed and arranged to operate in conjunction with the first to obtain the second region larger than the first.

ADVANTAGE - Exhibits reduced generation of eddy currents within MRI magnetic system, and modular design provides gradient coil of high efficiency and tailored volume.

US 5736858A

The gradient coils include a magnet for supplying large homogeneous static magnetic field to align spins in a subject within the interior space of magnet, radio frequency transmitter for generating RF signals at Larmor frequencies, RF coil for transmitting RF signals to tip the aligned spins to have at least a projection on a plane normal to static magnetic field, and at least one modular gradient coil set for varying static magnetic field to enable encoding free induction decay (FID) signal emitted by the tipped spins.

The modular gradient coil set includes modular gradient coils, the first of which is constructed and arranged to provide first region within the magnetic field having linear gradients for ultra-fast MRI, and second modular gradient coil arranged to provide a second region within the static magnetic field having linear gradients for conventional MRI. The second modular gradient coil is constructed and arranged to operate in conjunction with the first to obtain the second region larger than the first.

ADVANTAGE - Exhibits reduced generation of eddy currents within MRI magnetic system, and modular design provides gradient coil of high efficiency and tailored volume.

WEST

**End of Result Set**

Generate Collection Print

L14: Entry 2 of 2 File: DWPI Dec 7, 1988

DERWENT-ACC-NO: 1988-347434
DERWENT-WEEK: 198849


TITLE: Magnetic coil system for nuclear magnetic resonance tomography appts. - has radiation shield between background and gradient coils incorporating superconductive material

INVENTOR: RIES, G; SIEBOLD, H

PRIORITY-DATA: 1987DE-3718755 (June 4, 1987)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| EP 293723 A | December 7, 1988 | G | 008 | |
| DE 3852573 G | February 9, 1995 | | 000 | G01R033/38 |
| EP 293723 B1 | December 28, 1994 | G | 010 | G01R033/38 |
| JP 63311707 A | December 20, 1988 | | 000 | |
| US 4876510 A | October 24, 1989 | | 006 | |

INT-CL (IPC): A61B 10/00; G01N 24/06; G01R 33/22; G01R 33/38; G01R 33/42; H01F 7/20

ABSTRACTED-PUB-NO: EP 293723A
BASIC-ABSTRACT:

The magnetic coil system comprises superconductive coils (11.13) providing a homogenous background magnetic field and normally conductive coils (8) providing a magnetic field gradient. A cooled radiation shield (18) of an electrically and thermally conductive mateiral is inserted between the gradient coils (8) and the superconductive coils (11..13).

The radiation shield (18) contains a high temp. super-conductive material which exhibits normal conduction when the background field coils (11..13) are not energised and a superconductive state when the magnetic coil system is in the normal operating condition. Pref. the superconductive material is in the form of a thin layer (24) or coating applied to the shield (18).

ADVANTAGE - Effective attenuation of gradient field eddy currents.
ABSTRACTED-PUB-NO:

EP 293723B EQUIVALENT-ABSTRACTS:

A magnetic coil system (2) of a nuclear spin tomography apparatus with superconducting coils (11-13) for the generation of a homogeneous magnetic base field, with normal-conducting coils (8) within the internal space defined by the base field coils for the development of magnetic field gradients, and with at least one cooled radiation shield (18, 18a) composed of electrically and thermally conducting material which is arranged between the gradient coils and the super-conduc ting base field coils, characterised in that the radiation shield (18, 18a, 18b) for the shielding of the magnetic gradient field towards the exterior comprises superconducting material of the 2nd type of a high temperature superconductor (24, 24a, 24b) which during an excitation build-up process of the base field coils (11 to 13) is in the normal-conducting state and during the undisturbed operating state of the magnetic coil system (2) is in the superconducting state.

US 4876510A

The magnet coil system for nuclear spin tomography has superconducting coils for generating a homogeneous magnetic base field and nonsuperconduct ing coils within an interior region defined by the base field coils for developing magnetic field gradients.

At least one cooled radiation shield of electrically and thermally conductive material is arranged between the gradient coils and the superconducting base field coils.

To prevent eddy currents started in the radiation shield from distorting the gradient fields, the radiation field contains superconducting material of a "second kind" that is a high temperature superconductor. The superconductor is in a nonsuperconducting state at the start of an excitation process for the base field coilse and in a superconductin g state during the undisturbed operation of the magnet coil system. ADVANTAGE - Excludes time dependent external interference fields that occur after shimming of base field magnet.

(6pp)

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**End of Result Set**

Generate Collection Print

L19: Entry 1 of 1 File: DWPI Apr 19, 1994

DERWENT-ACC-NO: 1994-126557
DERWENT-WEEK: 199415


TITLE: Magnetic resonance imaging RF coil shielding appts - controls unwanted eddy currents using thin layer of conductive material e.g RF shield

INVENTOR: CARLSON, J W

PRIORITY-DATA: 1990US-0608807 (November 5, 1990)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| US 5304932 A | April 19, 1994 | | 006 | G01V003/00 |

INT-CL (IPC): G01V 3/00

ABSTRACTED-PUB-NO: US 5304932A
BASIC-ABSTRACT:

The MRI RF coil is shielded from extraneous noise sources using an extremely thin conductive shield interposed between the RF coil and the static magnetic structure of an MRI system. To control eddy currents induced in such conductor by the changing magnetic flux of MRI gradient coils, the RF shield conductor thickness is less than three skin depths at the MRI RF operating frequencies of the RF coil.

Pref, the RF shield conductor thickness is on the order of only one skin depth or less.

USE/ADVANTAGE - Shielding RF coils in MRI system from extraneous noise sources. Induced eddy currents from gradient pulses are small while retaining sufficient RF shielding from extraneous noise sources e.g laminated state magnet pole tips.

WEST

**End of Result Set**

Generate Collection Print

L21: Entry 1 of 1 File: DWPI Apr 17, 1996

DERWENT-ACC-NO: 1996-181670
DERWENT-WEEK: 199619


TITLE: Magnetic resonance imaging appts. - has circular static magnetic pole tip with several electrically isolated layers of arc-shaped ferromagnetic material and radii increasing from layers on one side to layers on distal side

INVENTOR: CARLSON, J W; KAUFMAN, L

PRIORITY-DATA: 1994US-0310338 (September 22, 1994), 1996US-0700995 (August 21, 1996)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| GB 2294120 A | April 17, 1996 | | 039 | G01R033/38 |
| US 5706575 A | January 13, 1998 | | 021 | H01F041/02 |
| JP 08206092 A | August 13, 1996 | | 012 | A61B005/055 |

INT-CL (IPC): A61 B 5/055; G01 R 33/38; H01 F 7/02; H01 F 41/02

ABSTRACTED-PUB-NO: GB 2294120A
BASIC-ABSTRACT:

The appts. includes a circular static magnetic pole tip having several electrically isolated layers of arc-shaped ferromagnetic material. A gradient coil is also provided in an MRI system which periodically operates to produce a gradient magnetic field. The static magnetic pole tip may include semi-closed loops.

Each isolated layer has a uniform radius curvature with the curvature radii increasing from layers on one side of the static magnetic pole tip to layers on a distal side. The isolated layers suppress eddy currants induced in the static magnetic pole tip during the operation of the gradient coil to permit 90 percent gradient magnetic field response in less than 0.5 ms after the operation of the gradient coil.

ADVANTAGE - Mfr. of static magnetic pole tip is reduced and effectiveness of pole tip is maintained in reducing Eddy currents during changes in gradient coil caused magnetic fields.
ABSTRACTED-PUB-NO:

US 5706575A EQUIVALENT-ABSTRACTS:

The appts. includes a circular static magnetic pole tip having several electrically isolated layers of arc-shaped ferromagnetic material. A gradient coil is also provided in an MRI system which periodically operates to produce a gradient magnetic field. The static magnetic pole tip may include semi-closed loops.

Each isolated layer has a uniform radius curvature with the curvature radii increasing from layers on one side of the static magnetic pole tip to layers on a distal side. The isolated layers suppress eddy currants induced in the static magnetic pole tip during the operation of the gradient coil to permit 90 percent gradient magnetic field response in less than 0.5 ms after the operation of the gradient coil.

ADVANTAGE - Mfr. of static magnetic pole tip is reduced and effectiveness of pole tip is maintained in reducing Eddy currents during changes in gradient coil caused magnetic fields.

WEST

**End of Result Set**

Generate Collection Print

L23: Entry 1 of 1 File: DWPI Feb 22, 1989

DERWENT-ACC-NO: 1989-055565
DERWENT-WEEK: 198908


TITLE: Improved gradient coil system magnetic resonance apparatus - has radially spaced arc conductors allowing higher patient accessibility

INVENTOR: HAM, C L G; OVERWEG, J A

PRIORITY-DATA: 1987NL-0001948 (August 19, 1987)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| EP 304126 A | February 22, 1989 | E | 008 | |
| DE 3875863 G | December 17, 1992 | | 000 | G01R033/40 |
| EP 304126 B1 | November 11, 1992 | E | 008 | G01R033/40 |
| JP 01070031 A | March 15, 1989 | | 000 | |
| NL 8701948 A | March 16, 1989 | | 000 | |
| US 4878023 A | October 31, 1989 | | 006 | |

INT-CL (IPC): A61B 10/00; G01N 24/06; G01R 33/12; G01R 33/40; H01F 7/20

ABSTRACTED-PUB-NO: EP 304126A
BASIC-ABSTRACT:

In the magnetic resonance apparatus arc conductors which contribute less to the field formation and which are situated further outwards are radially and/or axially positioned in a gradient coil system so that they compensate for stray fields of arc conductors which are more centrally situated and which contribute to the field formation. As a result of the radial displacement, the measuring space of the apparatus can be conically shaped, so that a higher patient accessibility is achieved or a smaller diameter can be imparted to a central portion.

Because no additional compensation coils are used and eddy currents are still prevented in electrically conductive shields enclosing the coil system, the power stored in the coil system is reduced.

ADVANTAGE - Control of coil system is improved notably for higher frequencies.
ABSTRACTED-PUB-NO:

EP 304126B EQUIVALENT-ABSTRACTS:

In the magnetic resonance apparatus arc conductors which contribute less to the field formation and which are situated further outwards are radially and/or axially positioned in a gradient coil system so that they compensate for stray fields of arc conductors which are more centrally situated and which contribute to the field formation. As a result of the radial displacement, the measuring space of the apparatus can be conically shaped, so that a higher patient accessibility is achieved or a smaller diameter can be imparted to a central portion.

Because no additional compensation coils are used and eddy currents are still prevented in electrically conductive shields enclosing the coil system, the power stored in the coil system is reduced.

ADVANTAGE - Control of coil system is improved notably for higher frequencies.

US 4878023A

The magnetic resonance apparatus has a system for generating a steady magnet field parallel to a central axis in a measurement space. A gradient coil system electively generates a gradient magnetic field in the measurement space superimposed on the steady magnetic field. The coil system has electrically series-connected effective and return art conductors lying in planes intersecting. The effective arc conductors contribute more to the generation of the gradient magnetic field than the return arc conductors. The return arc conductors are positioned to compensation for stray magnetic fields generated by the effective arc conductors.

The return arc conductors of the coil system extend across a cylinder surface having a diameter which is larger than that of the effective arc conductors.

ADVANTAGE - Reduced resultant stray field-higher patient accessibility. (6pp)r

WEST

Generate Collection Print

L26: Entry 1 of 3 File: DWPI Sep 29, 1993

DERWENT-ACC-NO: 1993-305097
DERWENT-WEEK: 200170


TITLE: Superconducting magnet assembly for magnetic resonance imaging appts. - includes superconducting gradient shield coil assembly for creating shielding magnetic fields that inhibit gradient field from inducing eddy currents

INVENTOR: DEMEESTER, G D; MORICH, M A ; PATRICK, J L

PRIORITY-DATA: 1992US-0859152 (March 27, 1992)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| EP 562708 A1 | September 29, 1993 | E | 009 | G01R033/38 |
| US 5289128 A | February 22, 1994 | | 009 | G01R033/20 |

INT-CL (IPC): G01R 33/20; G01R 33/38

ABSTRACTED-PUB-NO: EP 562708A
BASIC-ABSTRACT:

The assembly (10) comprises a cylindrical vacuum vessel (40) defining a central bore. At least one annular superconducting magnet (56) is disposed within the vacuum vessel. A low temperature reservoir (60) surrounding the superconducting magnet (56) holds a medium for holding the magnet below its superconducting temp.

The low temp. reservoir (60) is positioned within and sealed from the cylindrical vacuum vessel. A gradient shield coil assembly creates shielding magnetic fields that inhibit a gradient magnetic field produced within the bore from inducing eddy currents. The gradient shield coil assembly is a superconducting coil assembly.

USE/ADVANTAGE - Eg for NMR spectrometer. Maximises bore in magnet assembly with minimised diameter.
ABSTRACTED-PUB-NO:

US 5289128A EQUIVALENT-ABSTRACTS:

An examination region (12) is defined within the bore of a superconducting magnet assembly (10). An RF coil (22) and gradient magnetic field coils (14) are disposed within the bore of the superconducting magnet assembly around the examination region. The superconducting magnet includes a hollow, cylindrical vacuum vessel

(40). An annular, liquid helium holding low temperature reservoir (60) extends centrally through the vacuum vessel, but is sealed therefrom such that liquid helium is not drawn into the vacuum.

A number of annular superconducting magnets (56) are received in the low temperature reservoir immersed in the liquid helium. A cold shield (44) and a second cold shield (50) are mounted in the vacuum vessel surrounding the low temperature reservoir. A main magnetic field shield coil (66) is disposed in the low temperature reservoir outside of the annular superconducting magnets for cancelling the magnetic field generated by the annular magnets surrounding the magnet. A gradient shield coil (70) is mounted in low temperature reservoir inside the annular superconducting magnets to cancel magnetic fields generated by the gradient magnetic field coils in the region beyond the gradient shield coil.

WEST

Generate Collection Print

L26: Entry 2 of 3 File: DWPI Apr 24, 1990

DERWENT-ACC-NO: 1990-163689
DERWENT-WEEK: 199021


TITLE: Reducing base field shifts in magnetic resonance device - adjusts gradient field position w.r.t. magnet bore for coincidence with centre of field of conductive media around coil

INVENTOR: EGLOFF, H

PRIORITY-DATA: 1989US-0331424 (March 30, 1989)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| US 4920316 A | April 24, 1990 | | 000 | |
| CA 2008555 A | September 30, 1990 | | 000 | |
| CA 2008555 C | May 31, 1994 | | 000 | G01N024/08 |
| DE 69019408 E | June 22, 1995 | | 000 | G01R033/38 |
| EP 389911 A | October 3, 1990 | | 000 | |
| EP 389911 B1 | May 17, 1995 | E | 018 | G01R033/38 |

INT-CL (IPC): G01 N 24/08; G01 R 33/20; G01 R 33/38; G01 R 33/56

ABSTRACTED-PUB-NO: EP 389911B
BASIC-ABSTRACT:

A magnetic resonance imager/spectrometer includes a main magnet having a bore axially formed through it in which a base field is formed. A gradient field former is positioned inside the bore of the main magnet for providing at least one axial field gradient inside the bore. An electrically conductive media in the main magnet surrounds the gradient coil and has eddy current induced via pulsing of the gradient field which generates a disturbing magnetic field along the same axis as the gradient field.

A gradient position adjusting device including an adjustable postioner, is used for adjusting the position of the gradient field former with respect to the bore of the main magnet in order to cause the centre point of the axial magnetic fields of the electrically conductive media and the gradient field forming means to substantially coincide.

USE/ADVANTAGE - For magnetic resonance devices e.g. imagers, spectrometer s. Reduces pulsed field gradients caused by eddy currents.

ABSTRACTED-PUB-NO:

US 4920316A EQUIVALENT-ABSTRACTS:

A magnetic resonance device, comprising:

a main magnet (2) having a bore (10) axially formed therethrough in which a base field (H0) is formed;

gradient field forming means (18) positioned inside said bore of said main magnet for providing at least one field gradient along a given axis inside said bore and said gradient field forming means;

an electrically conductive media (12) located nearby said gradient field forming means in which eddy currents are induced by variation of said gradient fields to produce a disturbing magnetic field along said given axis; and

gradient position adjusting means (34, 36), including an adjustable positioner, for adjusting the position of said gradient field forming means with respect to said bore of said main magnet so as to cause the centre point of the magnetic field along said given axis of said gradient field forming means to substantially coincide with the center point of the disturbing magnetic field along said given axis,

characterised in that said gradient position adjusting means includes magnetic field sensing means (66-76) located inside said gradient field forming means for sensing the magnetic fields generate by both said electrically conductive media and said gradient field forming means,

said sensing means being positionable within said gradient field forming means to locate an axial center point of its magnetic field.

WEST

**End of Result Set**

Generate Collection Print

L26: Entry 3 of 3 File: DWPI Sep 21, 1988

DERWENT-ACC-NO: 1988-266152
DERWENT-WEEK: 198838


TITLE: Nuclear magnetic resonance imaging apparatus - has circular coil pair positioned so that terms in expression for magnetic flux density of composite field cancel each other out

INVENTOR: SIMADA, S; TAKECHI, M

PRIORITY-DATA: 1987JP-0064851 (March 18, 1987)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| GB 2202335 A | September 21, 1988 | | 011 | |
| GB 2202335 B | September 19, 1990 | | 000 | |
| JP 63229037 A | September 22, 1988 | | 000 | |
| US 4857848 A | August 15, 1989 | | 005 | |

INT-CL (IPC): A61B 10/00; G01N 24/06; G01R 33/22; H01F 7/20

ABSTRACTED-PUB-NO: GB 2202335A
BASIC-ABSTRACT:

A superconducting coil generates a static magnetic field, with an electrically-conducting tubular heat shield (2) surrounding the coil. A pair of confronting circular coils (5a,5b) which are coaxial with the longitudinal axis (Z) of the cylindrical thermal shield, generate a gradient field in the longitudinal direction (Z) of the shield. The magnetic field generated by the coils induced eddy currents (B) in the heat shield, which generate magnetic fields which form a composite magnetic field together with the magnetic field generated by the coils.

The coils are positioned so that the terms in the expression for the magnetic flux density of the composite magnetic field which are proportional to the cube of the distance in the longitudinal direction of thermal shield cancel one another. This is effected by arranging for the ratio of coil spacing (2Z), to coil radius (a) to be less than the normal value of sq.root of 3.

ADVANTAGE - Magnetic field flux density varies in highly linear manner.
ABSTRACTED-PUB-NO:

GB 2202335B EQUIVALENT-ABSTRACTS:

A nuclear magnetic resonance imaging apparatus having a superconducting coil which generates a static magnetic field, an electrically-conducting cylindrical thermal shield which surrounds said superconducting coil, and a pair of confronting circular coils which are coaxial with the longitudinal axis of said cylindrical thermal shield and generate a gradient field in the longitudinal direction of said thermal shield the magnetic field generated by said circular coils inducing eddy currents in said thermal shield said eddy current generating magnetic fields which form a composite magnetic field together with the magnetic field generated by said circular coils, characterised in that: said circular coils are positioned such that the terms which are proportional to the cube of distance in the longitudinal direction of said thermal shield in the expression for the magnetic flux density of said composite magnetic field substantial ly cancel one another.

US 4857848A

The nuclear magnetic resonance imaging apparatus has a superconducting coil which generates a static magnetic field, an electrically-conducting tubular heat shield which surrounds the superconducting coil, and a pair of confronting circular coils which are coaxial with the longitudinal axis of the cylindrical thermal shield and generate a gradient field in the longitudinal direction of the heat shield. The magnetic field generated by the circular coils induces eddy currents in the heat shield, and the eddy currents generate magnetic fields which form a composite magnetic field together with the magnetic field generated by the circular coils. The circular coils are positioned such that the terms in the expression for the magnetic flux density of the composite magnetic field which are proportional to the cube of the distance in the longitudinal direction of thermal shield cancel one another.

(5pp)